14222 - Full HST coverage of a comet-like exoplanet in transit

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) GJ-436 WAVE	STIS/CCD STIS/FUV-MAMA	4	28-Jul-2015 21:25:04.0	yes
02	(1) GJ-436 WAVE	STIS/CCD STIS/FUV-MAMA	4	28-Jul-2015 21:25:08.0	yes
03	(1) GJ-436 WAVE	STIS/CCD STIS/FUV-MAMA	4	28-Jul-2015 21:25:12.0	yes

12 Total Orbits Used

ABSTRACT

Exoplanets orbiting at close distances from their stars could lose some fraction of their atmospheres because of the extreme stellar irradiation. Hot rocky planets might have lost all of their atmospheres through this process, having evolved from larger progenitors with gas envelopes, possibly Neptune-mass exoplanets. The signature of this mass loss could be observed with HST/STIS at Lyman-alpha; however, there were no convincing detections of this effect for planets less massive than gas giants. New HST observations of the Neptune-mass exoplanet GJ 436b reveal a spectacular atmospheric escape. Although not strong enough to deplete the atmosphere of the planet in the lifetime of the parent star, it creates a huge exospheric cloud of atomic hydrogen eclipsing over half the stellar disk at Lyman-alpha. The exospheric cloud transit has an early ingress and numerical simulations predict it could last for almost half the 2.6-day revolution period of the planet, because of an extended comet-like tail. However, the current data do not stretch over this duration, and we propose here to use HST/STIS to cover the full transit. This will reveal the exact shape of GJ 436b exospheric cloud and allow us to discriminate between the two possible mechanism scuplting the cloud. The results could be applied to all moderately-irradiated exoplanets, in particular the planets around M dwarfs that will be detected by the TESS mission.

OBSERVING DESCRIPTION

We are going to do something similar to program GO#12965, except that we will not observe during the transit of the warm-Neptune planet as it is known in the optical. Practically, all settings will be similar to this previous program at the exception of the phase constraints on the first (ACQ) exposures of each visit.

Our past observations revealed a huge comet-like cloud of hydrogen surrounding the planet. The cloud starts transiting the star at least 2h before the start of the optical transit, and the comet-like tail trails the planet for more than 3h, possibly up to 20h after the end of the optical transit. Hence, we will spread the three visits so as to sample key moments of the comet-like cloud transit.

Visit

Proposal 14222, Visit 01, implementation Wed Jul 29 01:25:13 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: Period 2.64389803 D AND ZERO-PHASE HJD2454865.084034

Fixed Targets

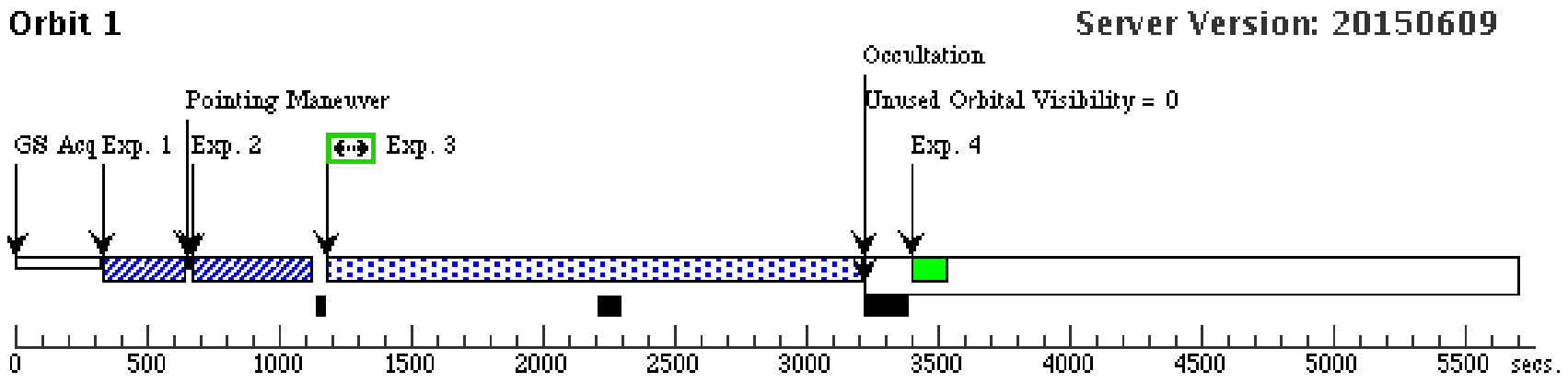
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ-436	RA: 11 42 11.0940 (175.5462250d)	Proper Motion RA: 896.07 mas/yr	V=10.59	Reference Frame: ICRS
	Alt Name1: LHS-310	Dec: +26 42 23.65 (26.70657d)	Proper Motion Dec: -813.54 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

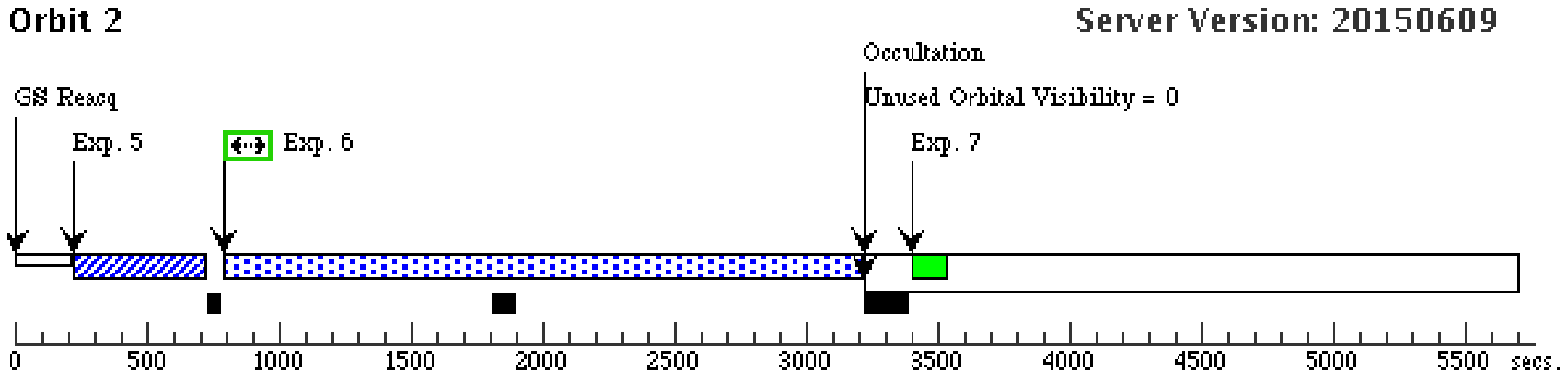
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

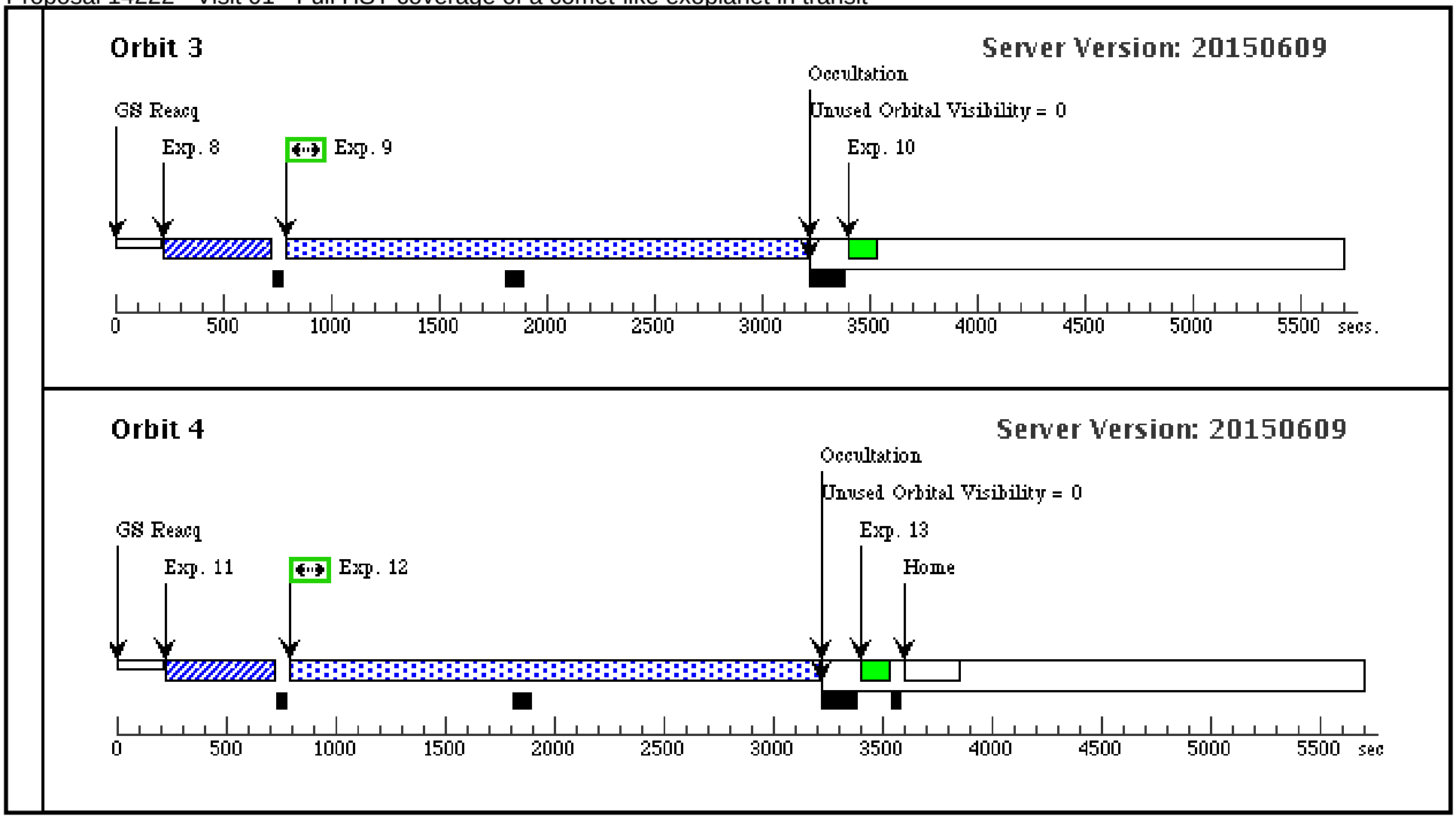
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(1) GJ-436	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.85 TO 0.87	Sequence 1-4 Non-Int in Visit 01	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[1]***
3	Science (STIS.sp.415432)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 01	1886 Secs (1886 Secs)	
								[==>]	***[1]***
Comments: Exact same settings as in GO#12965									
4	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 01	*[==>]*	***[1]***
5	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[2]***
6	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 01	2287 Secs (2287 Secs)	
								[==>]	***[2]***
Comments: Exact same settings as in GO#12965									
7	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 01	*[==>]*	***[2]***
8	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[3]***
9	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 01	2287 Secs (2287 Secs)	
								[==>]	***[3]***
Comments: Exact same settings as in GO#12965									
10	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 01	*[==>]*	***[3]***
11	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[4]***
12	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 01	2287 Secs (2287 Secs)	
								[==>]	***[4]***
Comments: Exact same settings as in GO#12965									
13	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 01	*[==>]*	***[4]***

Orbit Structure



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secs.
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Unused Orbital Visibility = 0
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Visit

Proposal 14222, Visit 02, implementation Wed Jul 29 01:25:14 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: Period 2.64389803 D AND ZERO-PHASE HJD2454865.084034

Fixed Targets

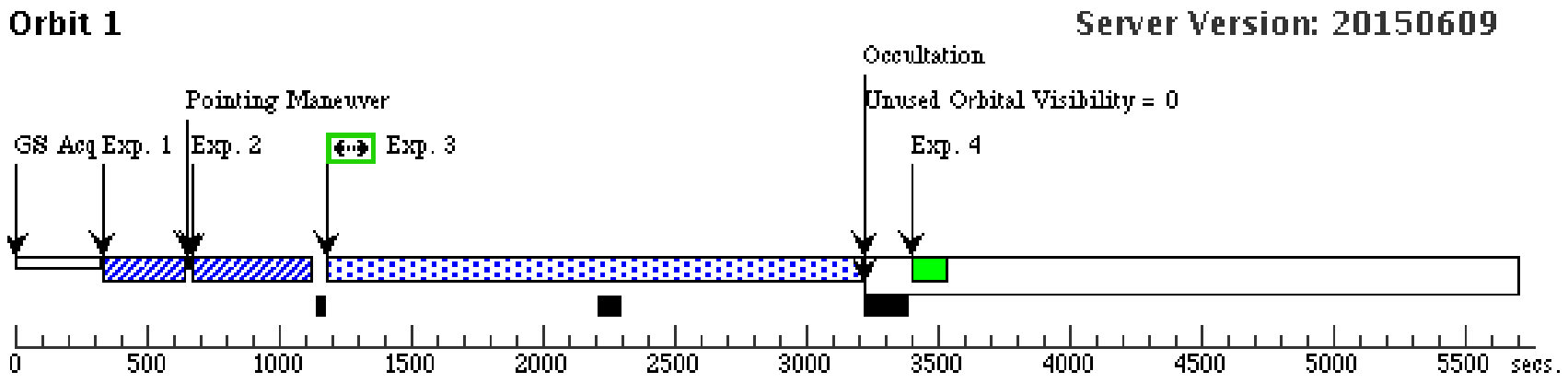
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ-436	RA: 11 42 11.0940 (175.5462250d)	Proper Motion RA: 896.07 mas/yr	V=10.59	Reference Frame: ICRS
	Alt Name1: LHS-310	Dec: +26 42 23.65 (26.70657d)	Proper Motion Dec: -813.54 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

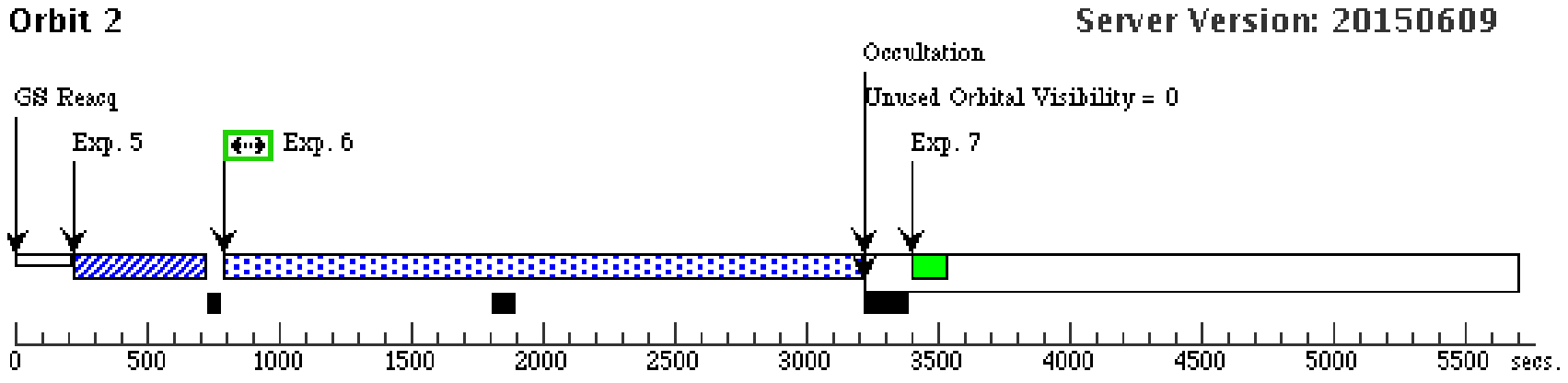
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

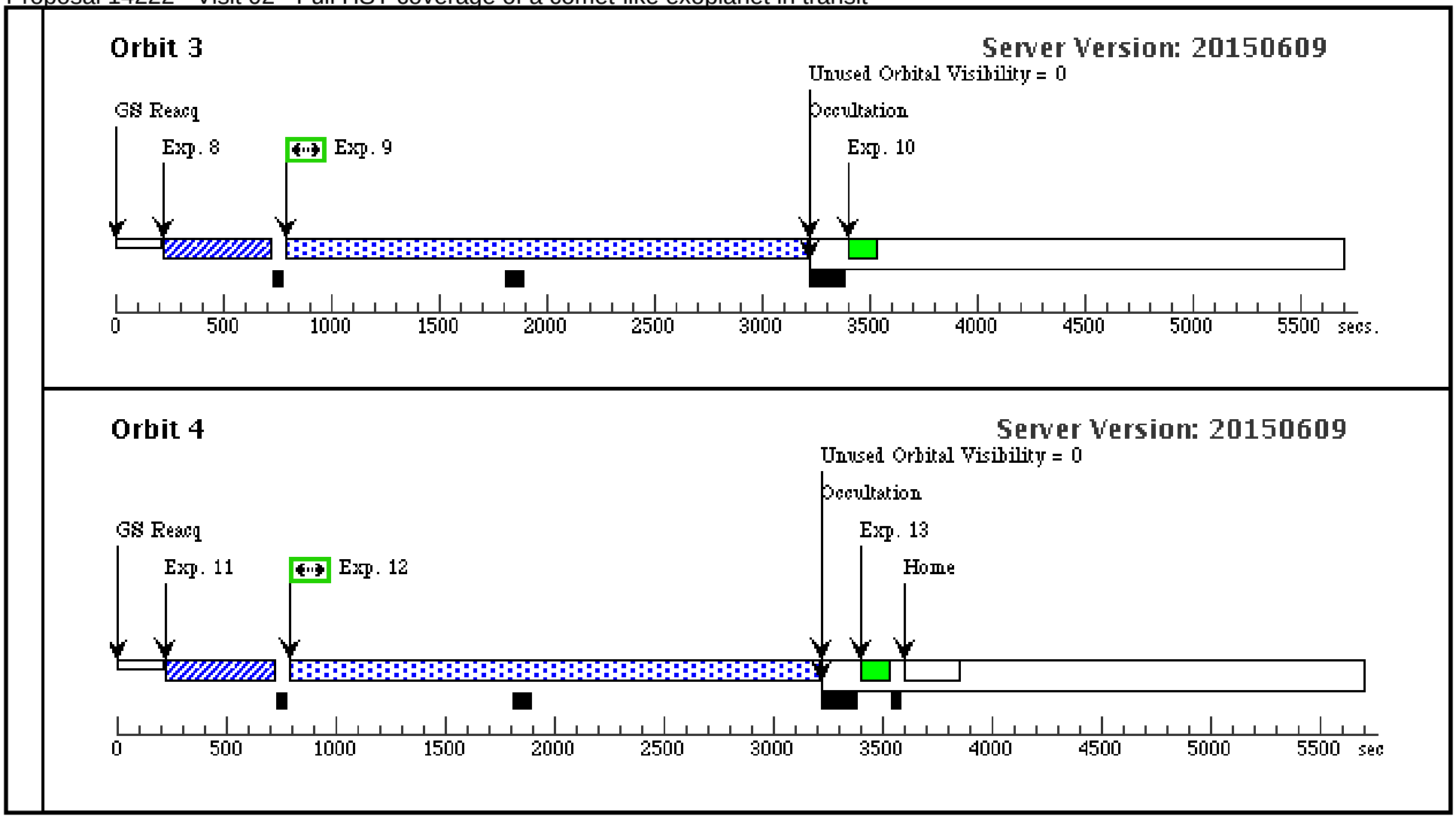
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(1) GJ-436	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.05 TO 0.07	Sequence 1-4 Non-Int in Visit 02	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[1]***
3	Science (STIS.sp.415432)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 02	1886 Secs (1886 Secs)	
								[==>]	***[1]***
	Comments: Exact same settings as in GO#12965								
4	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 02	*[==>]*	***[1]***
5	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[2]***
6	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 02	2287 Secs (2287 Secs)	
								[==>]	***[2]***
	Comments: Exact same settings as in GO#12965								
7	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 02	*[==>]*	***[2]***
8	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[3]***
9	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 02	2287 Secs (2287 Secs)	
								[==>]	***[3]***
	Comments: Exact same settings as in GO#12965								
10	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 02	*[==>]*	***[3]***
11	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[4]***
12	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 02	2287 Secs (2287 Secs)	
								[==>]	***[4]***
	Comments: Exact same settings as in GO#12965								
13	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 02	*[==>]*	***[4]***

Orbit Structure



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Unused Orbital Visibility = 0
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Visit

Proposal 14222, Visit 03, implementation Wed Jul 29 01:25:14 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: Period 2.64389803 D AND ZERO-PHASE HJD2454865.084034

Fixed Targets

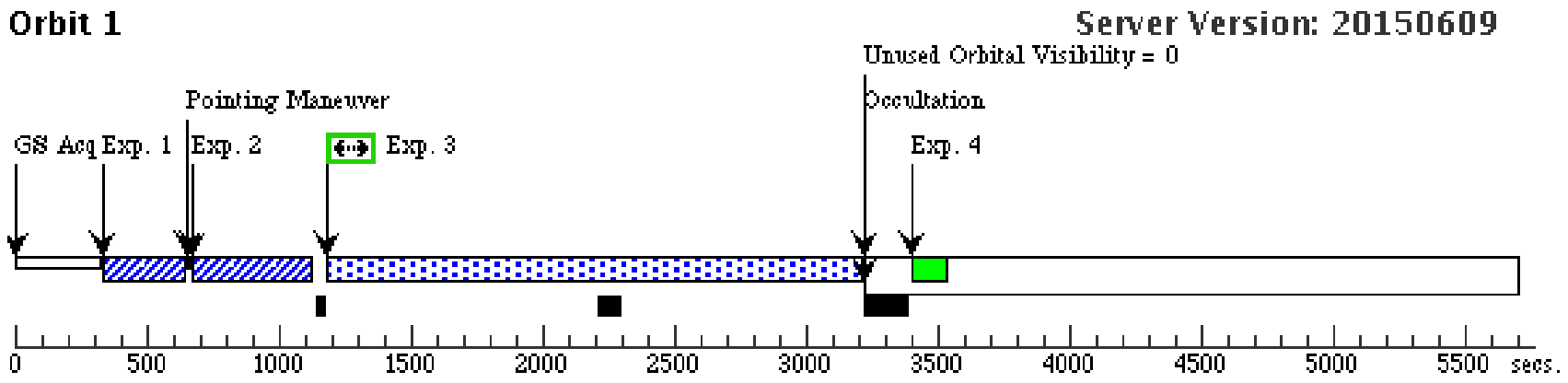
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ-436	RA: 11 42 11.0940 (175.5462250d)	Proper Motion RA: 896.07 mas/yr	V=10.59	Reference Frame: ICRS
	Alt Name1: LHS-310	Dec: +26 42 23.65 (26.70657d)	Proper Motion Dec: -813.54 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

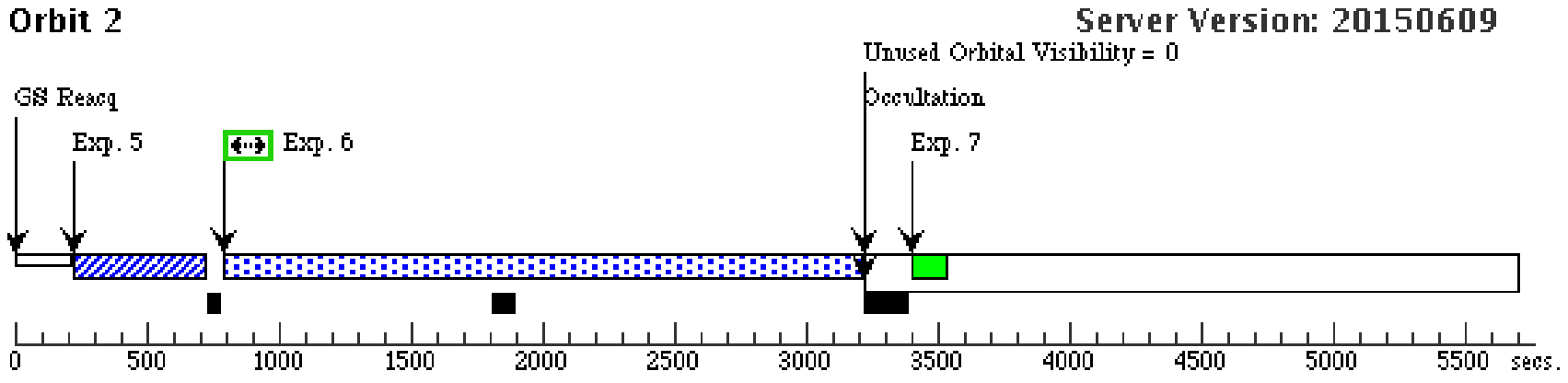
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

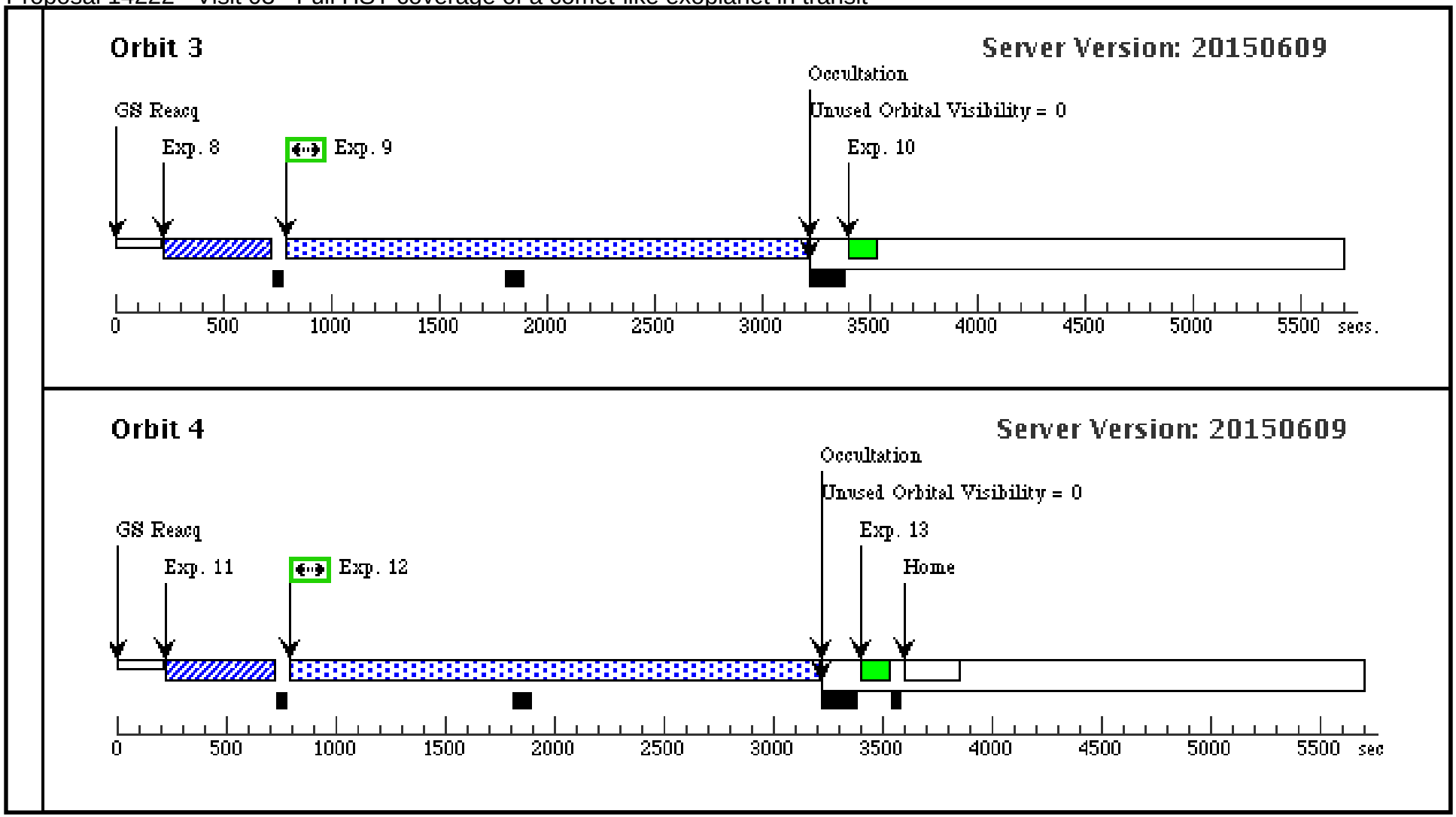
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(1) GJ-436	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.39 TO 0.41	Sequence 1-4 Non-Int in Visit 03	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[1]***
3	Science (STIS.sp.415432)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 03	1886 Secs (1886 Secs)	
								[==>]	***[1]***
Comments: Exact same settings as in GO#12965									
4	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 03	*[==>]*	***[1]***
5	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[2]***
6	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 03	2287 Secs (2287 Secs)	
								[==>]	***[2]***
Comments: Exact same settings as in GO#12965									
7	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 03	*[==>]*	***[2]***
8	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[3]***
9	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 03	2287 Secs (2287 Secs)	
								[==>]	***[3]***
Comments: Exact same settings as in GO#12965									
10	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 03	*[==>]*	***[3]***
11	ACQ/PEAK	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[4]***
12	Science (STIS.sp.415426)	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 03	2287 Secs (2287 Secs)	
								[==>]	***[4]***
Comments: Exact same settings as in GO#12965									
13	GO-wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 03	*[==>]*	***[4]***

Orbit Structure



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Orbit 4
Server Version: 20150609
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Unused Orbital Visibility = 0
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